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EXAMINER

CLEVELAND, MICHAEL B

ART UNIT	PAPER NUMBER
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1762

DATE MAILED: 01/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/872,110

Applicant(s)

SHAH ET AL.

Examiner

Michael Cleveland

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 27 October 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,5-17,19 and 39 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,5-17,19 and 39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 June 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

Art Unit: 1762

**DETAILED ACTION*****Drawings***

1. Color photographs and color drawings are acceptable only for examination purposes unless a petition filed under 37 CFR 1.84(a)(2) is granted permitting their use as acceptable drawings. In the event that applicant wishes to use the drawings currently on file as acceptable drawings, a petition must be filed for acceptance of the color photographs or color drawings as acceptable drawings. Any such petition must be accompanied by the appropriate fee set forth in 37 CFR 1.17(h), three sets of color drawings or color photographs, as appropriate, and an amendment to the first paragraph of the brief description of the drawings section of the specification which states:

The patent or application file contains at least one drawing executed in color. Copies of this patent or patent application publication with color drawing(s) will be provided by the U.S. Patent and Trademark Office upon request and payment of the necessary fee.

Color photographs will be accepted if the conditions for accepting color drawings have been satisfied.

***Claim Interpretation***

2. From MPEP 2113:

PRODUCT-BY-PROCESS CLAIMS ARE NOT LIMITED TO THE  
MANIPULATIONS OF THE RECITED STEPS, ONLY THE STRUCTURE  
IMPLIED BY THE STEPS

"[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979).

3. The specification indicates that the deposition of particles having been formed from an ultrasonically generated aerosol of a ruthenium-containing compound deposits a porous layer of the compound on the substrate (see p. 10, lines 14-23). Applicant asserts that the use of ultrasonic generation of the aerosol allows the generation of "particles on the order of microns to

Art Unit: 1762

submicrons" (p. 3, lines 14-22), but indicates that the spray is capable of providing particles of about 0.1 to 100 microns (p. 6, lines 1-14). Accordingly, the use of an "ultrasonically generated aerosol" has been interpreted to refer to any aerosol particle size capable of being generated by an ultrasonic nozzle, and is inclusive of particles within the disclosed range of 0.1-100 microns. The compound may be converted to an oxide, and may contain oxides of other metals (see p. 10, lines 18-33 and claims 2).

Applicant discusses the criticality of the use of a solvent devoid of alcohol at p. 11, line 28-col. 12, line 18. However, the only structural effect asserted in this passage is that the *substrate temperature during deposition* affects diffusion of ions into the substrate. Thus, the effects asserted in this passage are results of the substrate temperature during deposition, and not of the use of any particular solvent because there is no *necessary* link between the solvent and the substrate temperature. The solvent does not remain in the final product. Therefore, the use of a solvent devoid of alcohol in the method step has not been shown to result in any necessary structure in the product. Applicant asserts in the arguments that the use of ruthenium nitrosyl nitrate results in a coating with less residual chlorine. However, the open language of the claims permits other components, including halide-containing components to be in the precursor solution, and therefore such structure is not positively required by the claims.

#### ***Claim Objections***

4. The objection to claim 18 is withdrawn because Applicant has canceled the claim.

#### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 7-16, 19, and 39 are rejected under 35 U.S.C. 102(b) as being anticipated by Tong et al. (U.S. Patent 5,464,453, hereafter '453).

'453 teaches

- a) a substrate of a conductive metal (col. 5, lines 48-54; col. 6, lines 6-8); and

Art Unit: 1762

b) a coating of a metal-containing compound provided on a surface of the substrate, wherein the coating has been formed by ultrasonic spraying of the metal-containing compound in an alcohol solvent (col. 6, line 40-col. 7, line 9) (i.e., the coating comprises particles having been formed from an ultrasonically generated aerosol of the metal-containing compound contacted with the substrate.) The particular metal may be ruthenium (col. 5, line 55-64; Example 4). '453 does not teach that the solvent is alcohol-free. However, as stated above under the heading "Claim Interpretation", Applicant's specification does not reveal any structural features caused by the choice of solvent. While Applicant's comments imply that the choice of an alcohol solvent requires the use of a substrate temperature less than the flash point (e.g., 53 °F for isopropanol), '453 states that the substrate temperature during spraying of the solution may be from 0-150 °C (col. 6, lines 49-col. 7, line 9).

Claim 7-9: The coating may contain combinations of metal oxides (col. 5, lines 55-64), such as ruthenium and tantalum (Example 3).

Claim 10: The metal oxide layer has a thickness between about 0.1-100 microns (1000 Angstroms-0.1 mm) (col. 4, lines 8-9).

Claim 11: The Examples coat titanium and zirconium sheets.

Claim 12: The examples demonstrate substrate thickness of approx. 1 mil (0.0254 mm).

Claims 13-16: The substrate may be roughened prior to coating by methods such as acid etching with HCl or HF or else plasma etching/cleaning (col. 6, lines 10-35), thereby increasing the conductive substrate surface area.

Claim 19: '453 is silent as to the atmospheric pressure while spraying. However, Applicant does not describe any structural elements which arise from the claimed pressure range (see p. 16, lines 1-11). Therefore, the ultrasonically sprayed coating of the prior art appear appears to be identical to the claimed coating regardless of the atmospheric pressure during spraying.

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

Art Unit: 1762

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1, 7-16, 19, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tong et al. (U.S. Patent 5,464,453, hereafter '453) in view of Heffer (U.S. Patent 3,850,668, hereafter '668) and Applicant's admission. Evans (U.S. Patent 5,369,547, hereafter '547) is cited as evidence regarding claim 21.

'453 is discussed above, but does not explicitly teach that the precursor is ruthenium nitrosyl nitrate in aqueous solution. However, '453 does indicate that metal salts generally may be used as precursors (col. 6, lines 40-48), although ruthenium chloride is the only explicit example. Applicant states in the affidavit filed 10/3/2003 that it is understood by those skilled in the chlorine-contaminated tantalum oxide is undesirable. '668 teaches that an aqueous solution of ruthenium nitrosyl nitrate is an operative precursor for decomposition to ruthenium oxide (col. 3, lines 17-32). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used an aqueous solution of ruthenium nitrosyl nitrate as the particular precursor of '453 in order to achieve the art-recognized benefit of reducing chlorine contamination because ruthenium nitrosyl nitrate does not include chlorine and with a reasonable expectation of success because '668 teaches that an aqueous solution of ruthenium nitrosyl nitrate is an operative precursor for decomposition to ruthenium oxide.

10. Claims 5 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tong '453 and in view of Spitz et al. (U.S. Patent 3,840,391, hereafter '391).

Art Unit: 1762

'453 teaches the use of ultrasonic spraying of a precursor solution to form a high-surface area metal oxide layer, as described above. It is silent as to the diameter of the particles formed by the ultrasonic spraying and to the atmospheric pressure while spraying. Thus, it does not teach a particle diameter of less than about 10 microns nor a pressure of at least about 600 mmHg.

'391 teaches that ultrasonic spraying may be used to produce more uniform films by providing a narrower distribution of aerosol particle diameters than other spraying methods (col. 1, lines 13-67). Typical mean particle sizes are on the order of a few (e.g., 2-3) microns (col. 3, lines 6-24). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the ultrasonic spraying method of '453 to generate particles of a few microns in order to have made the film more uniform.

'391 also teaches that pressures near atmospheric (i.e., approximately 760 mmHg) are suitable for performing ultrasonic spraying. The selection of a known material or method based on its suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected a pressure of approximately 760 mmHg as the pressure of the ultrasonic spraying of '453 with a reasonable expectation of success because '391 recognizes the suitability of atmospheric pressure for ultrasonic spraying.

11. Claims 5 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tong '453 in view of Heffer '668 and Applicant's admission, as applied to claim 1 above, and further in view of Spitz '391 for substantially the same reasons discussed regarding claims 5 and 19, above.

12. Claims 6 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tong '453 and in view of Evans (U.S. Patent 5,369,547, hereafter '547).

Claim 6: '453 is described above. It teaches that the oxide has high surface area (col. 4, lines 1-9) for use in a capacitor (col. 1, lines 15-20), but does not quantitatively specify the area. Thus, it does not teach a surface area of 10 to 1500 m<sup>2</sup>/gram.

Art Unit: 1762

'547 also teaches the formation of a porous ruthenium oxide film via the pyrolysis of a ruthenium precursor on a heated substrate (col. 6, lines 36-54) for use in a capacitor (col. 1, lines 5-10). '547 teaches that the surface area of the oxide coating is up to about 120 square meters/g (col. 7, lines 19-22). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed the film of '453 with a surface area of 120 m<sup>2</sup>/g because '453 indicates that it desires a high surface area film ruthenium oxide film for use in a capacitor, and because '547 indicates that 120 m<sup>2</sup>/g is a useful surface area for ruthenium oxide films for use in capacitors. The selection of a known material or method based on its suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07.

Claim 17: '453 does not explicitly teach that the electric conductivity of the metal surface is increased before applying the porous metal oxide coating. '547 teaches that the surface conductivity of the substrate may be improved before coating via the method of U.S. Patent 5,098,485 to ensure good electrical contact between the substrate and the coating (col. 6, lines 65-68). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have increased the electrical conductivity of the substrate of '453 before having applied the porous coating because '547 indicates that such treatment would have ensured good electrical contact between the metal substrate and the porous oxide coating for use in a capacitor.

13. Claims 6 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tong '453 in view of Heffer '668 and Applicant's admission, as applied to claim 1 above, and further in view of Evans '547 for substantially the same reasons discussed regarding claims 6 and 17, above.

#### ***Terminal Disclaimer***

14. The terminal disclaimer filed on 10/6/2003 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of U.S. Patent 6,224,985 has been reviewed and is accepted. The terminal disclaimer has been recorded.



Art Unit: 1762

15. The terminal disclaimer filed on 10/6/2003 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of any patent granted on copending application 10/290,598 has been reviewed and is accepted. The terminal disclaimer has been recorded.

***Double Patenting***

16. The obviousness-type double patenting rejections are withdrawn in view of the terminal disclaimers.

***Response to Arguments***

17. Applicant's arguments filed 10/3/03, 10/24/2003, and 10/27/03 have been fully considered but they are not persuasive.

Response filed 10/3/2003

Applicant argues that heating to a temperature of 0 to 150 °C may not necessarily be sufficient to properly cure the porous coating material on the substrate. The argument is unconvincing because it is unsupported by evidence or even a positive assertion that the temperature is insufficient to properly cure the porous coating material. The argument is also not commensurate in scope with the claim 4 and its dependents, which do not require any particular substrate temperature. Applicant's further remarks regarding adhesion, capacitance, substrate temperature of at least 250 °C, and solvent free of alcohol are unconvincing because they rely on features which are not recited in the claims.

Applicant argues that the declaration filed 10/3/2003 demonstrates chloride-containing precursors would contaminate the film. The argument is unconvincing because 1) it is not commensurate in scope with the claims, which do not exclude the presence of halides in the solution or the film, 2) the presence of a single example using an aqueous solution of ruthenium nitrosyl nitrate is not reasonably probative of all halide-free ruthenium precursor solutions, 3) the comparative examples of the nitrosyl nitrate and the chloride use different amounts of the precursor (paragraph 12), 4) the claims are not commensurate in scope with the coating conditions described in paragraphs 12-18 of the declaration, 5) it does not state that the result that the nitrosyl nitrate solution leaves less residual chlorine than the chloride solution would have been unexpected by one of ordinary skill in the art, 6) the level of skill in the art is such that

Art Unit: 1762

one of ordinary skill in the art would have realized that any chloride precursor would be more likely to leave more residual than any non-chlorine containing precursor (including other halides, such as fluorides and iodides) simply because they do not contain chlorine to leave behind, and 7) Applicant states that the level of skill in the art is such that one of such skill would have been motivated to avoid chlorine contamination (paragraphs 25-27). The Examiner notes that only the first two lines of paragraph 28 transmitted legibly.

Response filed 10/24/2003

Applicant's arguments regarding the declaration have been substantially addressed above, with the following additional comments: Applicant's declaration attributes the benefit of the solution to the fact that it is halide-free. Therefore, the showing is not commensurate in scope with the claims because the claims use the open language "comprising" and therefore do not exclude the presence of halides. Also, the argument does not provide a comparison to other halide-free ruthenium precursor solution such as the alcohol solution of ruthenium acetate taught by Dowell.

Applicant's arguments regarding ruthenium nitrosyl nitrate are also unconvincing in view of Heffer '668 and Applicant's admission as discussed above.

Response filed 10/27/2003

Applicant did not make substantial arguments in the supplemental response of 10/27/2003.

***Conclusion***

18. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

Art Unit: 1762

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Cleveland whose telephone number is (703) 308-2331. The examiner can normally be reached on 8-5:30 M-F, with alternate Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 306-3186 for regular communications and (703) 306-3186 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



Michael Cleveland  
Patent Examiner  
January 16, 2004



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